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10/653,010	08/28/2003	Lawrence E. Pado	BO1 - 0269US	2102

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/653,010	**Applicant(s)** PADO, LAWRENCE E.	
	Examiner Joseph P. Hirl	**Art Unit** 2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-72* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-72* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 August 2003* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

1. This Final Office Action is in response to a Request for Continued Examination (RCE) entered March 10, 2008 for the patent application 10/653010 filed on August 28, 2003.

2. All prior office actions are fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claims 1-72 are pending.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-72 are rejected under 35 U.S.C. 102(b) as being anticipated by Pado et al (USPN 6,185,470, referred to as **Pado**).

Claims 1, 23, 24, 25, 47, 48, 49, 71, 72

Pado anticipates selecting parameters used in a cost function (**Pado**, c5:39-41; Examiner's Note: (EN): ¶ 11. applies); selecting an input weight to be applied to a control output by the cost function (**Pado**, c5:50-51); selectively incorporating predicted

future states generated by a neural network model (**Pado**, Fig. 1); iteratively applying a control input signal from a range of known signals, wherein the control signal is generated using a signal generator (**Pado**, c4:36-57; EN: signal generator is block 24); calculating a control output in response to the control input (**Pado**, Fig. 1; c4:52-67; c5:1-15); determining a control system phase and a control system amplitude of the control output in response to the control input (**Pado**, abstract; EN: ¶ 11. applies; phase is interpreted to be represented by a state; it is axiomatic that all electronic signals have amplitude); and combining a known plant phase with regards to a known signal equivalent to the control input and the control system phase such that effectiveness of the cost function parameters, the input weight, and the selectively incorporated predicted future states is determinable (**Pado**, abstract; EN: ¶ 11. applies; Pado's Performance Index Optimization is equivalent to a cost function).

Claims 2, 26, 50

Pado anticipates wherein the input weight to be applied by the cost function is iteratively selected from among a range of input weights (**Pado**, Fig. 1; c4:52-67; c5:1-15).

Claims 3, 27, 51

Pado anticipates the control input signal comprises a sinusoidal wave which linearly increases in frequency over time (**Pado**, Fig. 3; EN: such is NN Learning).

Claims 4, 28, 52

Pado anticipates selectively incorporating the predicted future states includes selecting a subset of the predicted future states generated by the neural network model (**Pado**, Fig. 1; c4:52-67; c5:1-15).

Claims 5, 29, 53

Pado anticipates selectively incorporating the predicted future states includes incorporating two of the predicted future states generated by the neural network model (**Pado**, Fig. 1; c4:52-67; c5:1-15).

Claims 6, 30, 54

Pado anticipates selectively incorporating the predicted future states includes incorporating all of the predicted future states and combining each of the predicted future states with a forget factor such that a proportional weight is accorded each of the predicted future states (**Pado**, Fig. 1; c4:52-67; c5:1-15; EN: the forget factor is defined by weight, specification at page 3, line 9).

Claims 7, 31, 55

Pado anticipates the forget factor comprises a base number in the range from .1 to 5.0 **(Pado**, c4:10-24; EN: the forget factor is defined by weights that have values of .1 to 5.0; the weights have values and can be adjusted to the limiting range).

Claims 8, 32, 56

Pado anticipates wherein the forget factor is raised to a positive integer exponent which begins with 1 and is incremented by 1 for each of the predicted states **(Pado**, c5:50-51; EN: W^i where i takes on values 1, 2, 3 ... integers).

Claims 9, 33, 57

Pado anticipates sequencing the combining of the forget factors with the predicted future states such that each of the forget factors is applied to each of the predicted future states **(Pado,** Fig. 1; c4:52-67; c5:1-50).

Claims 10, 34, 58

Pado anticipates the range of known signals applied as the control input signal includes a chirp signal (**Pado**, c2:26-29).

Claims 11, 35, 59

Pado anticipates the cost function includes an expression defined on page 12, claim 11 of the specification **(Pado,** c5:44).

Claims 12, 15, 36, 39, 60, 63

Pado anticipates the cost function parameters selected is the position gain and the velocity gain **(Pado,** c5:48-51).

Claims 13, 16, 37, 40, 61, 64

Pado anticipates the position gain selected includes one of 0 and 1 and the velocity gain selected includes one of 0 and 1 **(Pado,** c5:54-55).

Claims 14, 38, 62

Pado anticipates includes an expression defined on page 12, claim 14 of the specification **(Pado,** c5:44).

Claims 17, 41, 65

Pado anticipates a combination of parameters and input weight resulting in three consecutive maximum control output values is dismissed as unstable, wherein the

maximum control output value is the highest output of which the controller is capable in attempting to apply a corrective signal to the operating plant (**Pado,** Fig. 3; such would be wing acceleration during learning).

Claims 18, 42, 66

Pado anticipates iteratively applying the control input from the range of known signals ceases for the combination of parameters and input weight resulting in three consecutive maximum control values dismissed as unstable, wherein the maximum control value is the highest output of which the controller is capable in attempting to apply a corrective signal to the operational plant (**Pado**, Fig. 3; such would be wing acceleration during learning).

Claims 19, 43, 67

Pado anticipates the control system phase is determined by performing a fast Fourier transform of the control output and wherein the control is the response to the control input signal (**Pado**, Figs. 1 and 3; EN: requirements do not provide limitations since control will always be related to the control input signal … they are the same; and a fast Fourier transform just does a fast Fourier transform without any functional event).

Claims 20, 44, 68

Pado anticipates combinations of the cost function parameters, the input weight, and the predicted future states are considered stable if the sum of the control system phase differential and operational plant phase differential is either between +150 and +180 degrees or between –150 and –180 degrees, wherein the control system phase differential is the phase difference between a control input and a control output, and

wherein the operational plant phase differential is the phase difference between the plant input and the plant output (**Pado**, Figs. 4A (424) and 5 (524) cite conditions for stability different from that of the instant claim (180 degrees +/- 30) and with such inconsistency, the quantitatively considerations of this claim are ignored; Abstract anticipates cost, weight and future values).

Claims 21, 45, 69

Pado anticipates more stable combinations of the cost function parameters, the input weight, and the predicted future states are those for which the sum of the control system phase and the known plant phase is closest to 180 degrees or negative 180 degrees and less stable combinations of the cost function parameters, the input weight, and the predicted future states are those for which the sum of the control system phase and the plant phase is closest to 0 degrees (**Pado**, Figs. 4A (424) and 5 (524) cite conditions for stability different from that of the instant claim (180 degrees +/- 30) and with such inconsistency, the quantitatively considerations of this claim are ignored; Abstract anticipates cost, weight and future values).

Claims 22, 46, 70

Pado anticipates the parameters used in the cost function, the input weights to be applied to the control output, and the predicted future states are selected based on stable combinations of the cost function parameters, the input weight, and the predicted future states (**Pado**, Abstract anticipates cost, weight and future values; EN: stable combinations are the result of a trained neural network).

Response to Arguments

6. Applicant's arguments filed on March 10, 2008 related to Claims 1-72 have been fully considered but are not persuasive.

In reference to Applicant's argument:

Regarding this claim element, the Office Action at page 3, states "iteratively applying a control input signal from a range of known signals, wherein the control input signal is generated using a signal generator (Pado, c4:36-57; EN signal generator is block 24). However, Pado at column 4, lines 36-60 discloses:

> Conventional use of neural networks to model future system states involves feeding one predicted state output at each instance of time back into the neural network and then predicts another state output for the next instance in time. Such a recursive method of predicting future states, however, tends to increase prediction time mad compound the error from each prediction with each iteration until the prediction itself becomes meaningless. In contrast, the architecture of neural network 18 according to the present invention provides a parallel processing arrangement including a future state prediction horizon for efficient computation without compounding errors. By using neural network 18 to model plant 12, system 10 may be applied to a wide variety of complex, nonlinear systems mad is particularly well suited for active flutter suppression, buffet load alleviation, or any vibration suppression system.
>
> Referring again to FIG. 1, system 10 first trains the neural network plant model 18 for use within its predictive control framework. System 10 receives sensor feedback y(n) from plant 12, digitizes it and then feeds it via line 32 into the inputs of neural network 18. The sensor output y(n) represents past state information and passes through a digital tapped-delay-line. In this embodiment, system 10 implements the tapped-delay-line in software with a stack, or array, of past values ofy(n) over the past m time steps.

As illustrated above, Block 24 is not described in the section of Pado cited in the Office Action. Applicants note that Pado at column 4, lines 60-62 discloses:

> As shown in FIG. 1, a block 24 labeled z"1 represents a memory for the development of the plant output history.

As can be seen from the foregoing, the Examiner-identified portions of Pado do <u>not recite</u> the signal generator as recited in Independent Claim 1. For example, claim 1 recites "iteratively applying a control input signal from a range of known signals, wherein the control input signal is generated using a signal generator."

Applicant has reviewed the Examiner-cited portions of Pado and is unable to locate a recitation of the signal generator of Claim 1. Applicant notes that on page 8 of the Office Action, the Examiner asserts that the term "signal generator" may be "interpreted as the training data set for the neural network Pado et al., c7:1-4." In contrast, Pado at column 7, lines 1-4 discloses:

> If online learning is engaged, system 10 updates the neural network weights using a set of input/output data and an appropriate training algorithm. System 10 repeats the entire process for each control cycle.

As can be seen from the foregoing, the Examiner-identified portions of Pado do <u>not recite</u> the signal

generator as recited in Independent Claim 1. Nor does this section of Pado recite even a "training data set" as asserted by the Examiner. Moreover, neither Pado nor the Examiner provide any relationship between this section of Pado and block 24.

Therefore, Applicant further respectfully points out that the Examiner has provided no evidence or reason as to why the block 24 which represents a memory should be interpreted to teach the signal generator of Independent Claims 1, 23-25, 47-49, and 72 as the Examiner alleges.

Applicant respectfully points out that the Applicant's Application is the only objective examiner-cited document of record that shows or suggests what Examiner purports the reference to teach. From this and Pado's express recitations (see above), it follows that Examiner is interpreting Pado through the lens of Applicant's application, which is impermissible hindsight use.

Examiner's response:

¶ 10. applies. The section of the prior art of Pado et al. referenced to C4:36-57 and Fig. 1, explains the recursive nature of a neural network as depicted in Fig. 1. Applicant did not provide a definition of a signal generator in the specification. Applicant did provide on page 4 of the specification, lines 20-27 reference to a software signal generator at lines 22 and 23 and a reference to signal generator at line 26 that by antecedent then refers aback to software signal generator at lines 22 and 23. Therefore, in accordance with MPEP 2111.01 I., the term "signal generator" , not having been defined by the applicant, will be interpreted "as broadly at the terms reasonably allow" (not in light of the specification) and hence the reference to block 24 of Fig. 1 is indeed a signal generator. In the prior art of Pado, Fig. 1 is a block diagram of a neural predictive control system described in an electrical configuration by Pado at c2:30-48 and known to all of ordinary skill in the art, the items referenced by the various lines of the block diagram are indeed signals encoded with the respective functionality. Hence the connection between block 24 and block 18 has a signal on it. Since such signal does not initiate unto itself, the logical conclusion to one of ordinary skill in the art is that block 24 is indeed a signal generator. Applicant should be aware that since Pado

at the reference of c4:36-57 references Fig. 1 at line 52, indeed the reference of Pado at c4:36-57 cites the signal generator of Claim1. Regarding the “training data set”, when one updates the neural network, that input to update is a training data set.

In reference to Applicant’s argument:

Claims 3, 27, and 51 recite in part:

> wherein the control input signal comprises a sinusoidal wave which linearly increases in frequency over time.

Regarding claims 3, 27, and 51, the Office action at page 3 states "Pado anticipates the control input signal comprises a sinusoidal wave which linearly increases in frequency over time (Pado, Fig. 3; EN such is NN Learning)." Figure 3 of Pado illustrates:

Pado describes Figure 3 at column 7, lines 5-25 as follows:

> According to the invention, system 10 provides predictive control simultaneously with the training of neural network 18. FIG. 3 is an exemplary plot which illustrates adaptive control of plant 12 in which training and predictive control occur together. Starting with an untrained network 18, a white noise excitation signal is sent to plant 12 for four seconds, providing 400 data points for learning by neural network 18. In this example, learning then occurs during the next 2.7 seconds, allowing control to be activated at about 6.7 seconds. As shown in FIG. 3, the plant vibration grows steadily until control system 10 initiates stabilization. Once system 10 activates its performance optimization routine 52, learning and control occur simultaneously, allowing model updates to occur every 6.7 seconds. The speed of the processor(s) 20, the control cycle rate, and the amount of data needed for accurate plant modeling determine the length of this time interval (e.g., processor 20 is embodied by a 133 MHz Pentium® processor running at 2500 Hz). The optimum settings for the level of excitation, the amount of data needed for learning, and the performance index used by the system optimization loop is plant dependent.

Figure 3 illustrates wing acceleration over time. In Figure 3, it appears that the amplitude of the wing acceleration changes over time. In fact, Figure 3 illustrates in the NN Learning section that after NN Learning begins that the 1st acceleration peak after the dotted line is higher than the 2nd acceleration peak. The 3rd acceleration peak is lower that both the 1st and 2nd peaks. Thus the wing acceleration decreases from the Ist to 3rd acceleration peaks. In fact, there are three portions of the NN Learning section where the peak wing acceleration decreases. Therefore, the amplitude of the peak wing acceleration shown in Figure 3 does not linearly <u>increases in frequency</u> over time as recited in claims 3, 27, and 51.

However, the amplitude of a signal is not the same as the signals frequency. The frequency of a signal is the number of cycles of the signal in a fixed period of time. In Figure 3, the number of acceleration cycles in a fixed period of time appears to be approximately constant. Thus, the wing acceleration <u>frequency is approximately constant.</u> Consequently, Figure 3 can not teach "a sinusoidal wave which <u>linearly increases in frequency</u> over time" as recited in claims 3, 27, and 51.

Examiner's response:

¶ 10. applies. The subject claim limits to sinusoidal waves. Fig. 3 illustration represents periodic waves but not a sinusoidal waves per se. However, it is well known in the art that a periodic wave can be represented by a composition of sinusoidal waves of varying frequency and amplitude. The subject claims do not limit to amplitude but do limit to frequency. As observed in the NN learning, from 4 sec to 6 sec, the amplitude does increase meaning that the rise time of the slope will increase considering that the period of the waves is constant. With the sharper rise time, it will be necessary for higher frequency components to be present and since the slope is generally linear from 4-6 seconds, the composition of sinusoidal waves to make up the illustrated periodic wave have sinusoidal wave components that linearly increase in frequency over time. Examiner did not reference c7:5-25.

Examination Considerations

7. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris,* 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the

art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

8. Examiner's Notes are provided with the cited references to prior art to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and spirit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but a link to prior art that one of ordinary skill in the art would find inherently appropriate.

9. Unless otherwise annotated, Examiner's statements are to be interpreted in reference to that of one of ordinary skill in the art. Statements made in reference to the condition of the disclosure constitute, on the face of it, the basis and such would be obvious to one of ordinary skill in the art, establishing thereby an inherent prima facie statement.

10. Examiner's Opinion: ¶¶ 7.-9. apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

11. This is a continuation of applicant's earlier Application No. 10/653010. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had

been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Claims 1-72 are rejected.

Correspondence Information

13. Any inquiry concerning this information or related to the subject disclosure should be directed to the Primary Examiner, Joseph P. Hirl, whose telephone number is (571) 272-3685. The Examiner can be reached on Monday – Thursday from 5:30 a.m. to 4:00 p.m.

As detailed in MPEP 502.03, communications via Internet e-mail are at the discretion of the applicant. Without a written authorization by applicant recorded in the applicant's file, the USPTO will not respond via e-mail to any Internet correspondence

which contains information subject to the confidentiality requirement as set forth in 35 U.S.C. 122. A paper copy of such correspondence will be placed in the appropriate patent application. The following is an example authorization which may be used by the applicant:

> Notwithstanding the lack of security with Internet Communications, I hereby authorize the USPTO to communicate with me concerning any subject matter related to the instant application by e-mail. I understand that a copy of such communications related to formal submissions will be made of record in the applications file.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, David R. Vincent can be reached at (571) 272-3080.

Any response to this office action should be mailed to:

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/Joseph P. Hirl/
Primary Examiner, Art Unit 2129
April 30, 2008